

A. Smith et al.
Preliminary Amendment
Divisional Application

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in this divisional application:

LISTING OF CLAIMS:

Claim 1. (Canceled) A method of manufacturing a reference substrate on a projection imaging tool, the method comprising:

providing at least one reticle, the at least one reticle including interlocking rows and columns of alignment attributes;

exposing the at least one reticle onto a substrate that includes a recording media, in a pattern such that adjacent exposures create a pattern of interlocking alignment attributes;

developing the recording media;

etching the exposed substrate;

stripping the substrate of the recording media;

providing an intra-field error of the projection imaging tool;

measuring overlay errors of desired alignment attributes and calculating the positional coordinates of the desired alignment attributes with respect to the intra-field error and overlay errors, and creating a calibration file associated with the reference substrate that records the positional coordinates of the alignment attributes.

Claim 2 (Canceled) A method as defined in claim 1, wherein measuring the overlay errors further comprises using an overlay metrology tool.

Claim 3 (Canceled) A method as defined in claim 1, wherein the substrate is a semiconductor silicon wafer.

A. Smith et al.
Preliminary Amendment
Divisional Application

Claim 4 (Canceled) A method as defined in claim 1, wherein the substrate is a semiconductor quartz wafer.

Claim 5 (Canceled) A method as defined in claim 1, wherein the substrate is a flat panel display.

Claim 6 (Canceled) A method as defined in claim 1, wherein the substrate is a reticle.

Claim 7 (Canceled) A method as defined in claim 1, wherein the substrate is a photo-mask.

Claim 8 (Canceled) A method as defined in claim 1, wherein the substrate is a mask plate.

Claim 9 (Canceled) A method as defined in claim 1, wherein measuring the overlay errors includes using an optical overlay metrology tool.

Claim 10 (Canceled) A method as defined in claim 1, wherein the recording media is a positive resist material.

Claim 11 (Canceled) A method as defined in claim 1, wherein the recording media is a negative resist material.

Claim 12 (Canceled) A method as defined in claim 1, wherein the recording media is an electronic CCD.

Claim 13 (Canceled) A method as defined in claim 1, wherein the recording media is a diode array.

A. Smith et al.
Preliminary Amendment
Divisional Application

Claim 14 (Canceled) A method as defined in claim 1, wherein the recording media is a liquid crystal.

Claim 15 (Canceled) A method as defined in claim 1, wherein the recording media is an optically sensitive material.

Claim 16 (Canceled) A method as defined in claim 1, wherein the at least one reticle is chrome patterned glass.

Claim 17 (Canceled) A method as defined in claim 16, further including a reflective dielectric coating.

Claim 18 (Canceled) A method as defined in claim 1, wherein the at least one reticle is an attenuated phase shift mask.

Claim 19 (Canceled) A method as defined in claim 1, wherein the at least one reticle is reflective.

Claim 20 (Canceled) A method as defined in claim 1, wherein the alignment attributes include a box-in-box pattern.

Claim 21 (Canceled) A method as defined in claim 1, wherein the alignment attributes include a frame-in-frame pattern.

Claim 22 (Canceled) A method as defined in claim 1, wherein the alignment attributes include a vernier pattern.

A. Smith et al.
Preliminary Amendment
Divisional Application

Claim 23 (Canceled) A method as defined in claim 1, wherein the alignment attributes include a segmented bar-in-bar pattern.

Claim 24 (Canceled) A method as defined in claim 1, wherein the alignment attributes include a grating.

Claim 25 (Canceled) A method as defined in claim 1, wherein the at least one reticle is a single reticle.

Claim 26 (Canceled) A method as defined in claim 1, wherein the at least one reticle includes multiple reticles wherein a first reticle includes a first type of alignment attributes and a second reticle includes a second type of alignment attributes.

Claim 27 (Canceled) A method as defined in claim 26, wherein a plurality of the second type of reticles are used.

Claim 28 (Original) An apparatus for use in alignment of projection imaging tools, the apparatus comprising:

a substrate that has alignment attributes that occur in interlocking rows and columns across the substrate; and

a calibration file associated with the substrate that indicates the position of the alignment attributes on the substrate.

Claim 29 (Original) An apparatus as defined in claim 28, wherein the calibration file is recorded onto a computer readable medium.

A. Smith et al.
Preliminary Amendment
Divisional Application

Claim 30 (Original) A method of using a reference wafer comprising:
loading the reference wafer, that includes overlay targets, onto an imaging
machine;

loading and aligning an overlay reticle onto the imaging machine;
exposing the reference wafer with the overlay reticle;
developing the reference wafer;
measuring the overlay targets;
subtracting offset values, associated with the wafer, from the measurements;
and
calculating errors of the machine.

Claim 31 (Original) A method as defined in claim 30, wherein the
machine is a stepper projection imaging system.

Claim 32 (Original) A method as defined in claim 30, wherein the
machine is a scanning projection imaging system.

Claim 33 (Original) A method as defined in claim 30, wherein the
machine is an electron beam imaging system.

Claim 34 (Original) A method as defined in claim 30, wherein the
machine is an electron beam direct write system.

Claim 35 (Original) A method as defined in claim 30, wherein the
machine is a SCAPEL tool.

Claim 36 (Original) A method as defined in claim 30, wherein the
machine is an extreme ultra-violet imaging tool.

A. Smith et al.
Preliminary Amendment
Divisional Application

Claim 37 (Original) A method as defined in claim 30, wherein the machine is an ion projection imaging tool.

Claim 38 (Original) A method as defined in claim 30, wherein the machine is an x-ray imaging system.

Claim 49 (Original) A method as defined in claim 30, wherein the subtracting and calculating after performed on a computer.

Claim 50 (Original) A method as defined in claim 30, wherein the offset values associated with the reference wafer are stored in a calibration file.

Claim 51 (Original) A method as defined in claim 50, wherein the calibration file is stored on a computer readable medium.